CLAIMS

1. Method of producing a complex structure wherein respective connecting faces of two basic structures (1, 3; 1, 3, 19; 20, 21, 23, 25) are brought into contact and assembled, characterized in that, before bringing them into contact, a tangential stress state difference is created between the two faces to be assembled, this difference being selected to obtain within the assembled structure a predetermined stress state under given conditions relative to the assembly conditions.

2. Method according to claim 1 of producing a complex structure, characterized in that the tangential stress state difference between the two faces to be assembled is imposed by curving each of the two basic structures to be assembled.

3. Method according to claim 2 of producing a complex structure, characterized in that the two structures are curved so that the two faces to be assembled are respectively concave and convex.

4. Method according to claim 3 of producing a complex structure, characterized in that the two structures are curved so that the two faces to be assembled are complementary.

5. Method according to claim 4 of producing a complex structure, characterized in that the two structures are curved so that the two faces to be assembled are respectively spherical concave and spherical convex.

6. Method according to any one of claims 3 to 5 of producing a complex structure, characterized in that the curvature of the two structures is created by applying mechanical forces to each of the two structures.

7. Method according to claim 6 of producing a complex structure, characterized in that the mechanical forces applied to the basic structure result from the creation of a pressure difference between the two faces of

said structure.

8. Method according to claim 7 of producing a complex structure, characterized in that the pressure difference between the two faces of the structure to be curved so that it has a concave face to be assembled is created by aspirating said structure onto a concave preform having a suitable profile selected as a function of that to be imparted to the face to be assembled and on which the structure rests locally at its periphery.

9. Method according to claim 7 of producing a complex structure, characterized in that the pressure difference between the two faces of the structure to be curved so that it has a concave face to be assembled is created by aspirating said structure into a cavity, the structure resting locally at its periphery on a seal bordering the cavity.

10. Method according to claim 6 of producing a complex structure, characterized in that the mechanical forces applied are the result of deforming the structure between complementary first and second preforms, one of which is concave and the other of which is convex, with profiles selected as a function of that to be imparted to the face to be assembled.

11. Method according to claim 10 of producing a complex structure, characterized in that the first preform is one of the concave structures to be assembled that has already been curved to the selected profile.

12. Method according to claim 10 or claim 11 of producing a complex structure, characterized in that the second preform has aspiration channels for keeping the structure curved, once the first preform has been removed.

13. Method according to claim 6 of producing a complex structure, characterized in that the mechanical forces are applied simultaneously to the two structures to be assembled by deforming the two structures between two

preforms having profiles selected as a function of those to be imparted to the faces to be assembled.

14. Method according to any one of claims 6 to 13 of producing a complex structure, characterized in that mechanical forces are applied to at least one of the substrates by means of a preform consisting of a mold.

15. Method according to claim 14 of producing a complex structure, characterized in that said preform consists of a porous mold.

16. Method according to any one of claims 6 to 13 of producing a complex structure, characterized in that mechanical forces are applied to the substrates with the aid of at least one deformable preform.

17. Method according to any one of claims 1 to 13 of producing a complex structure, characterized in that the two structures are assembled by molecular bonding.

18. Method according to claim 14 of producing a complex structure, characterized in that the two faces to be assembled are treated to facilitate bonding.

19. Method according to any one of claims 1 to 18 of producing a complex structure, characterized in that the substrates are assembled by direct contact, the surface of at least one of these substrates being adapted to prevent air from being trapped between the assembled surfaces.

20. Method according to claim 19 of producing a complex structure, characterized in that at least one of the substrates is pierced.

21. Method according to claim 20 of producing a complex structure, characterized in that said substrate is pierced at its center.

22. Method according to claim 21 of producing a complex structure, characterized in that at least one of the substrates includes at least one dead-end channel discharging at the edge of the substrate.

23. Method according to any one of claims 1 to 16

of producing a complex structure, characterized in that the substrates are assembled by means of a flow layer.

24. Method according to any one of claims 1 to 23 of producing a complex structure, characterized in that assembly is carried out at a temperature higher than room temperature.

25. Method according to claim 24 of producing a complex structure, characterized in that the substrates are heated by contact with heated preforms.

26. Method according to claim 25 of producing a complex structure, characterized in that the preforms are heated to respective different temperatures.

27. Method according to any one of claims 1 to 26 of producing a complex structure, characterized in that the method further includes a technology step including a change of temperature, the tangential stress state difference between the two faces to be assembled being selected so that, during this step, the stresses within the assembled structure remain below a predetermined stress threshold.

28. Method according to claim 27 of producing a complex structure, characterized in that the technology step is a heat treatment step.

29. Method according to any one of claims 1 to 28 of producing a complex structure, characterized in that the method further includes, after assembling the two basic structures, a step of thinning one of these two structures to produce a thin film, the tangential stress state difference between the two faces to be assembled being selected to impose a given stress level within the resulting thin film.

30. Method according to claim 29 of producing a complex structure, characterized in that the thin film is assembled to another basic structure by creating, prior to assembly, a tangential stress state difference between the

two faces to be assembled, that difference being selected to obtain within the new assembled structure a predetermined stress state under given conditions relative to the assembly conditions.

31. Method according to any one of claims 1 to 30 of producing a complex structure, characterized in that the method further includes an epitaxy step for producing an epitaxially grown film (23) of a material on an external face of the complex structure, the tangential stress state difference being selected so that, at the epitaxy temperature, that external face has a lattice parameter compatible with epitaxial growth of the required material.

32. Method according to claim 31 of producing a complex structure, characterized in that the structure on which epitaxy is to be effected is a thin film (22) obtained by thinning said structure after assembly.

33. Method according to either claim 31 or claim 32 of producing a complex structure, characterized in that the method further includes the following steps:

- assembling the complex structure including the epitaxially grown film (23) onto another structure (25) via respective connecting faces by creating, a tangential stress state difference between these two new faces to be assembled prior to assembly,
- thinning the complex structure to expose a face of the epitaxially grown thin film (23), and
- epitaxially growing a new material (26) on the exposed face of the thin film,

the tangential stress state difference between the two new faces to be assembled being selected so that the lattice parameter of the epitaxially grown thin film (23) is compatible with epitaxial growth of the new material (26) to be grown epitaxially.

34. Method according to any one of claims 1 to 33, characterized in that it is carried out in a controlled

atmosphere.

35. Method according to any one of claims 1 to 33, characterized in that it is carried out in a hydrogen atmosphere.